5.0 MAJOR DESIGN FEATURES

5.1 Introduction

This section describes the major design features associated with the alternatives. All of the alternatives meet the ADOT design standards in the ADOT Roadway Design Guidelines. ***Similar to our AASHTO analysis, this section was compiled using standards and controls derived from the 1990 AASHTO greenbook, and the 1996 ADOT RDG. As these documents have undergone changes, the following criteria must be evaluated before further studies or designs are conducted.***

5.2 Design Controls

The following design controls were used in the development of the alternatives:

- Design Year: 2025
- Design Speed:
  - 70 mph (Controlled Access Highway – Rolling Terrain) for Segment E
  - 60 mph (Rural Divided Highway – Mountainous Terrain)
  - 55 mph (Rural Non-divided Highway – Mountainous Terrain)
  - 60 mph (Urban/Urban Fringe Area)
- Shoulder and Lane Widths: (see also Typical Sections, Appendix A):
  - Travel Lane Width: 12-feet
  - Center Left-Turn Lane: 12-feet
  - Shoulder Width:
    - Divided Roadway
      - Outside Shoulder: 10-feet
      - Inside Shoulder: 4-feet
    - Urban Fringe - Undivided 8-feet
    - Urban Fringe - Undivided w/Shoulder Barrier or Retaining Wall 10-feet
  - Drainage Ditch Offset: 30-feet for Rural Sections
- Slope Criteria: ADOT Standard Detail C-02.20
- Gradient:
  - 4% Maximum (Rural Divided, Rolling Terrain)
  - 6% Maximum (Rural Divided, Mountainous Terrain)
  - 7% Maximum (Rural Non-Divided, Mountainous Terrain
  - 6% Maximum (Urban Fringe, Rolling Terrain)
  - 8% Maximum (Urban Fringe, Mountainous Terrain)
- Maximum Superelevation: 0.10 ft/ft (Rural under 4000 feet elevation) –Segment E
  0.08 ft/ft (Rural over 4000 feet elevation)
- Maximum Curvature (based on max. superelevation of 0.10 ft/ft):

Design Speed (mph)	Degree of Curvature
60	5°15′
70	3°30′

- Maximum Curvature (based on max. superelevation of 0.08 ft/ft):

Design Speed (mph)	Degree of Curvature
55	6°00′
60	4°45′

- All other roadway features per current ADOT standards called out in the Roadway Design Guidelines.

5.3 Horizontal and Vertical Alignments

The existing horizontal and vertical alignment for US 60 will be used as much as possible where each alternative incorporates the existing roadway and where the design criteria is met for the design speeds listed in Section 5.2. Of 105 horizontal curves in the existing roadway, only 3 meet ADOT's recommended superelevation rates for the design speed. Where the existing alignment containing the non-conforming curves is incorporated into the alternatives, the existing US 60 roadway will require reconstruction.

There are 164 vertical curves on US 60 within the study limits. The stopping sight distance of 56 of these vertical curves is less than the recommended minimums for the design speeds listed in Section 5.2. Where the existing alignment containing the non-conforming curves is incorporated into the alternatives, the existing US 60 roadway will require reconstruction.

Utilizing the existing roadway in the new roadway sections is desirable for the following reasons:

- To mitigate the impact on the environment by minimizing the construction area
- To maintain existing access to adjoining properties
- Reduces the cost of the proposed improvements

5.4 Access

Control of access is recommended along US 60 to enhance traffic operations and safety as well as to preclude uncontrolled future access and random strip development. Existing access in the rural areas will be maintained with paved median crossovers only at major access points. Where alternatives are within developed urban areas existing access will be maintained. Left turns into driveways between intersections will be controlled with raised median.

5.5 Right-of-Way

The desirable right-of-way width per ADOT standards (Figure 306.2) is 100 feet from the centerline of the nearest divided roadway in rural sections. Several of the alternatives in the Town of Superior area and the Top of the World area would use the existing roadway for one direction of travel and a new alignment for the opposite direction of travel. New one-way alignments would be on new right of way with desirable width of 200 feet. The opposite direction of travel on the existing roadway would use existing right of way. Additional right-of-way for cut and fill slopes will be required in mountainous areas.

The existing right-of-way through the rural section of the project varies from 100 to 200 feet half-width, except through the Top of the World area where the right of way width reduces to 50 feet half-width according to ADOT as-built plans.

The section of the project through Miami and Globe is classified as urban arterial. The existing roadway includes 4 lanes and median situated in 80 to 130 feet of existing right-of-way according to ADOT as-built plans. The desirable right-of-way width of 140 feet is not met

through Miami and Globe. If a third lane is added in each direction as discussed in the traffic section of the Feasibility Study (Section 2), at least 120 feet to 150 of right-of-way should be obtained. Alternatives identified for further study bypass the urban arterial section and require new right of way on new alignment. It is not anticipated that the existing right of way in this area will change.

Additional right-of-way will be required from the Tonto National Forest, state trust land and from private owners.

5.6 Drainage

Drainage conditions have been evaluated in a separate drainage memorandum prepared for this study, entitled: *US 60 Superior to Globe, Drainage Memorandum, dated August 2000*. This evaluation was completed prior to the determination to consider alternatives north of the Miami/Globe area. As a result, the drainage documents developed for the feasibility study do not adequately address the drainage concerns through Segment F.

5.6.1 Existing Conditions

The watersheds contributing to proposed crossings of US 60 from Superior to Globe total approximately 81 square miles in area. **Figure 5-1** delineates the watershed boundaries. The terrain is mountainous on both the north and south sides of US 60. The entire west half of the study area is characterized by extremely steep slopes and all drainage paths are well defined. The east half of the study area is comprised of moderately steep rolling terrain with well-defined drainage paths.

For purposes of this study, the area has been divided into six primary drainage watersheds; Queen Creek, Devils Canyon, Pinto Creek, Solitude Tailings Pond, Pinal Creek, and Gilson Wash.
The ADOT Highway Drainage Design Manual (HDDM, March 1993) hydrologic modeling procedures, equations, standard tables and figures were used to generate the hydrologic and hydraulic data.

5.6.2 Vegetation

The study area vegetation ranges from desert cacti, shrubbery, and small trees in the lower elevations to dense brush and trees above 4000 feet. Hillsides to the south of Globe are typically grazed rangeland with intermittent stands of brush. Vegetative cover is estimated as a percent of undeveloped areas.

5.6.3 Existing Culverts and Bridges

There are four bridges, five box culverts and four major pipe culverts along existing US 60 between Superior and MP 140 where the proposed alignment diverts from the existing US 60. Two of the major pipe culverts and one box culvert will experience overtopping with a 50-year frequency storm. One additional box culvert appears to be marginal. The preliminary analysis indicates no overtopping of the four bridge sites during a 50-year storm.

Smaller culvert crossings (42-inch diameter and less) have not yet been analyzed.

5.7 Constructability and Traffic Control

Maintenance of traffic through the work zone is a critical element associated with any improvement of US 60. There are no alternate routes available for US 60 traffic between Superior and Globe; therefore, traffic will have to be maintained through construction areas.

Through much of the study area the new highway will be constructed on new alignment, traffic can be maintained on the existing roadway during construction. In areas where the existing roadway will be used for one direction of travel, the new one-way roadway can be constructed with traffic remaining on existing. Traffic can then be routed over the new roadway while necessary improvements are made to the existing road. However, local traffic will have to be maintained on the existing road during construction, which will require construction staging and phasing.

An alternative has been identified and described that incorporate a viaduct section with the westbound lanes over the eastbound lanes that are using the existing roadway for a 1-mile distance. Other alternatives incorporate 5-lane, 2-way roadways using existing alignment for relatively short distances. In both of these situations traffic must be maintained through the construction areas with minimum delays and closures.

No major detours are anticipated with the construction of any of the alternatives. Some minor detours will be necessary where connections between existing roadways and new construction are needed.

5.8 Utilities

All known utility companies within the project limits were contacted and information was requested regarding utilities and an indication of possible conflicts with the alternative roadway improvements under study. A summary of the results follows:

- El Paso Natural Gas Company has a 6-inch natural gas line that crosses SR 77 south of US 70 east of Globe. The contact person for this utility is:
  El Paso Natural Gas Company
  Bill Ward
  7815 S 48th Street
  Phoenix, Arizona 85044
  Phone: (602) 438-4224

- Southwest Gas has a number of crossings of US 60 in the study area. The contact person for this utility is:
  Southwest Gas Company
  Chuck Braizel.
  5440 South Russell Road
  Globe, Arizona 85502
  Phone: (520) 425-8195

- US West has both overhead and underground facilities along US 60 from Superior to Miami. The contact person for this utility is:
  US West Communications.
  Chuck Conduit
  1996 Hwy 88
  Globe, Arizona 85501
  Phone: (520) 537-2400

- Arizona Water Co. has various waterlines in the Town of Superior that cross US 60 and a 12” water line that follows the Magma Arizona Railroad tracks from SR 79 to Superior. The contact person for this utility is:
  Arizona Water Company
  Superior Division
  Angel Gomez
  20 North Magma Avenue
  Superior, Arizona 85273
  Phone: (520) 689-2312

- Arizona Public Service Company has overhead power lines near Top of the World, Globe/Miami area, and in the Town of Superior. The contact person for this utility is:
  APS.
  Frank Castillo
  P.O. Box 2600
  Globe, Arizona 85502
  Phone: (520) 425-8029

- Salt River Project Electric has transmission lines in the area. The contact person for this utility is:
  SRP
  Bill Philips
  Transmission Line Design
  P.O. Box 52025, MS XCT 315
  Phoenix, AZ 85072
  Phone: (602) 236-8092

- BHP Copper operates the Magma Arizona Railroad that must be crossed near the beginning of Segment A. The contact person for this utility is:
  BHP/San Manuel Arizona Railroad Company
  Victor Crumley
  Railroad Supervisor
  200 South Redington Road
  P.O. Box M
  San Manuel, Arizona 85631
  Phone: (520) 385-3129

- Arizona Eastern Railroad owns the railroad tracks northeast of the junction of SR 77 and US 70 east of Globe. The tracks must be crossed in Segment E. The contact person for this utility is:
  Arizona Eastern Railroad
  Donald Tolle
  General Manager
  P.O. Box 2200
  Claypool , AZ 85532
  Phone: (520) 473-2447

- Town of Superior has sewers lines along and across US 60. The contact person is:
  Rick Hettler, Public Works Director
  Town of Superior
  734 Main Street
  Superior, AZ 85273

Eagle West Cable TV has cable TV lines along US 60 in the Town of Superior. The contact person is:

Eagle West Cable TV
Anthony Figueroa
PO Box 567
Kearny, AZ 85326

- City of Globe has water and sewer lines along US 60, US 70 and SR 77. The contact person is:

  City of Globe
  Frank Renteria
  Water/Wastewater Supt.
  150 N. Pine St.
  Globe, AZ 85501

- Cable One has TV cable along US 60, US 70 and SR 77. The contact person is:

  Cable One
  Ingo Radicke
  PO Box 69
  Globe, AZ 85501

5.9 Design Exceptions

No design exceptions are anticipated for the alternative alignments at this time. Two of the alternatives contain features that exceed the ADOT maximums. Alternative A-3 contains grades that exceed 6 percent for mountainous terrain and Alternative E-1 has grades that exceed the maximum for rolling terrain of 4 percent. The recommended alternative has not been selected so design exceptions are premature. A detailed evaluation will become part of the final design concept evaluation.